but they apparently arise from the rachis, the actual pedicel being reduced to an inconspicuous length. I have interpreted the inflorescence of *Killipiella* as consisting of a short rachis, bearing several imbricate bracts and a terminal subsessile flower. If this interpretation is correct, such an inflorescence is probably a reduction from the racemose several-flowered type which is common in the family. The deeply cleft calyx-limb and corolla of the new genus are unlike these organs in *Disterigma*, while the proportionately short filaments, the basal anther-appendages, and the conspicuous disk further differentiate it. The copiously tuberculate anther-tubules of *Killipiella* are not matched in any other vacciniaceous genus known to me, the tubules elsewhere being smooth, or in some cases obscurely tuberculate at the very base.

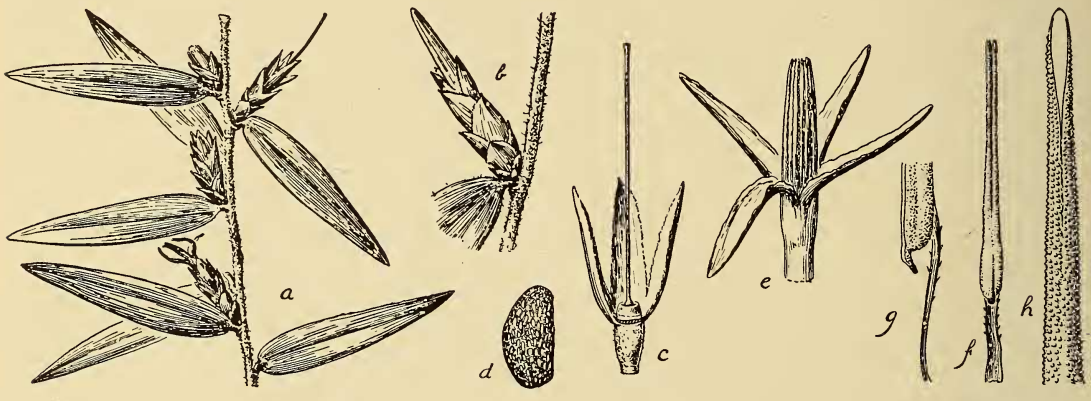

Fig. 1.—*Killipiella styphelioides: a*, Portion of branchlet, with four inflorescences, the lowermost with corolla in position, ×1; *b*, an inflorescence, with projecting corolla-bud, ×2; *c*, calyx, with one lobe removed, showing disk and style, ×3; *d*, ovule, ×12; *e*, corolla and stamens, ×3; *f*, stamen, introrse view, ×4; *g*, detail of base of stamen, ×6; *h*, detail of apex of tubule, ×50.

BOTANY.—*Stem and foliage scab of sweet potato* (Ipomoea batatas).[1]

ANNA E. JENKINS, Bureau of Plant Industry, Soils, and Agricultural Engineering, and AHMÉS P. VIÉGAS, Instituto Agronômico do Estado de São Paulo, Brazil.

New findings in widely separated parts of the world of a previously little known but destructive disease of sweet potato (*Ipomoea batatas* Poir.), including the discovery of a hitherto unknown stage in the life history of the pathogen *Sphaceloma batatas* Saw., are here reported. It seems desirable also to review the two sole accounts[2] of this disease, since these earlier records, in Japanese, are not readily available to occidental readers.

HISTORICAL

In 1931, Sawada (6) reported the occurrence in Formosa of what he termed the "bud stunting disease" of sweet potato. This had been present in Formosa since as early as 1910, as shown by the 19 specimens cited in connection with the description of the pathogen. The first of these, as well as five others, were gathered by R. Suzuki. It has been learned, however, from correspondence with Sawada (1938) that Suzuki did not realize at the time that a new disease was concerned. "When the disease is severe," Sawada states (6), "it is impossible to correct it." He continues:

"The disease is severe in localities where rain, dew, or mist is abundant. In high mountainous regions sweet potatoes grown at high elevations are easily attacked, because of abundant mist; also those grown in shaded places because of dews. Among

[1] Received March 30, 1943.

[2] For a translation of these two articles the writers are indebted to K. Katsura.

sweet potato varieties 'Red Skin' is the most susceptible."

In 1937, K. Goto[3] reported (2) severely diseased sweet-potato vines from Kagoshima-Ken, Amami Islands, as affected by Sawada's bud stunting disease. He noted: "The writer received a specimen of diseased potato stems and leaves from Mr. Taro Hōko of Kagoshima-Ken, on September 23 of this year (1937), with a note by him stating that there is an outbreak of the disease every year in the Amami Islands, and asking the author's opinion regarding the disease. He was of the opinion that the disease is caused by a fungus belonging to *Sphaceloma*, since it resembles anthracnose of grapes." (Fig. 1, *C*.)

Goto referred to the vine disease of sweet potatoes as "shoot scab." It is here called "stem and foliage scab."

GEOGRAPHIC RANGE

In September, 1937, R. G. Oakley, of the United States Bureau of Entomology and Plant Quarantine, found this same disease on the island of Guam; he sent specimens to his Bureau, whence they were referred to the senior writer, who made the diagnosis. The symptoms represented (Fig. 1, *B*) were entirely in agreement with the description. A specimen from Guam was then sent to Sawada, who was of the same opinion and who contributed part of the type specimen of *Sphaceloma batatas* (Fig. 1, *A*).

In 1938 and 1939 Oakley again sent specimens of the disease from Guam. In transmitting the specimen of 1938 (Guam 726) he wrote[4] that "the appearance of sweet potatoes affected by the disorder is very unusual as they, in some cases, grow straight upwards a foot higher than vines growing normally." He has furnished a summary of the prevalence of the disease in Guam during 1937–1939 as follows:

"The disease was plentiful in 1937 when patches of infected vines could be discerned at a distance of 25 yards by the straight and high growing shoots," these extending "above the normal growth. Field infections in 1938 were less plentiful, and in 1939 diseased vines could rarely be found and then only after extended search."

In Guam, where sweet potatoes have long been cultivated, only two previous references to diseases of the crop have been found. During Weston's (7) plant-disease survey of the island in 1918, he reported white rust (*Albugo* sp.). Several years earlier, when David T. Fullaway, entomologist of the Hawaii Agricultural Experiment Station, made an entomological survey of Guam (1), he found "sweet potatoes badly blighted by a fungus disease." In 1938, replying to an inquiry, accompanied by a photograph of a specimen from Guam (Fig. 1, *B*), he wrote that he believed this disease was the same as that discovered by Oakley in 1937, although it was difficult to remember over so long a period. About this time replies to similar inquiries were received as follows: O. H. Swezy, of Hawaii, who made an insect pest survey in Guam in 1936, wrote: "My recollection is that the leaves [of sweet potatoes] were always in good condition, except for a small amount of caterpillar work, which was distinctly different from the condition shown in your photos." G. O. Ocfemia stated that so far as he knew, stem and foliage scab had not been found in the Philippines. G. K. Parris, who catalogued the plant diseases of Hawaii (4), wrote that the disease had not been recorded in that Territory.

In Brazil stem and foliage scab of sweet potatoes was discovered on plants growing on the experiment farm of the Instituto Agronômico at Campinas, first in January, 1939, by A. S. Costa, and again in February, 1940, by O. Boock. Diseased specimens gathered at Campinas are similar to those from Pacific regions. A specimen of diseased sweet-potato leaves from Alagoinhas, Baía, Brazil, collected in March, 1937, by H. S. Fawcett and A. A. Bitancourt resembles closely the specimen from Campinas and evidently represents the same disease. It was collected as a possible *Sphaceloma* disease, but upon microscopic examination in São Paulo no organism was distinguished,

[3] Laboratory of Black-rot Control, Agricultural Experiment Station, Tiba, Japan.

[4] Letter dated June 5, 1938, addressed to E. R. Sasscer, Division of Foreign Plant Quarantine.

nor was any isolated.[5] Such a situation is not unusual in the case of infection by species of *Sphaceloma*. *S. batatas* was scant on the material from Guam examined microscopically; the specimens sent in 1938 were picked fresh and forwarded by clipper mail but cultures from them yielded negative results as did those made from specimens sent by Sawada in August, 1938. Goto, however, succeeded in isolating the organism.

SYMPTOMS

Symptoms of the disease on leaves as described by Sawada are as follows:

"On leaves, veins are mostly attacked; spots small, round or oblong, slightly concave, cinnamon or vinaceous tawny, 1–2.5 mm in diam., mostly in groups, which later coalesce; outer surface of more or less corky appearance, depending on the degree of the attack; leaves become curled or their growth checked, petioles curled, veins shrunken."

Sawada did not describe stem cankers, although these are present on specimens that he sent (Fig. 1, *A*).

Goto states that the disease appears to attack young organs, and that the growth of leaves and stems becomes irregular and produces many abnormal shapes, as well as stunting of petioles and blades. The following description of stem cankers is from Goto's account:

On the extreme tip of the shoot and somewhat below, spots appear as flat or somewhat raised purple brown dots, depressed at the center, with a gray or light brown border. The marginal region appears water-soaked when the weather is damp. Farther downward the diseased spot becomes gradually larger, 0.5–3 mm, and is circular, oblong, or spindle-shaped, or intermediate between these shapes, somewhat depressed, gray or brown, and somewhat roughened or scablike. Where the stem is green, the spot is surrounded by a narrow purple margin, which is sometimes depressed. Dark brown spots also appear on the attacked area. Where cankers are numerous they coalesce, forming a large scab. Spots on petioles are of similar appearance to those on stems; however, they seem a little larger, over 5 mm in length. All the spots become whitish with age.

The stem cankers on the specimens from Brazil agree with those described by Goto. On the leaves, however, interveinal spots are fully as numerous as those on veins.

THE PATHOGEN

Sawada's illustration of *Sphaceloma batatas* is reproduced in Fig. 2, *D*, and his description of the fungus is given below:

Sphaceloma batatas Saw.

Mycelium scanty, penetrating the cell walls of the diseased tissue, colorless, septate, 2–2.5μ in diameter, acervuli colorless, forming under the epidermis and later become exposed by rupturing the epidermis, 12–25μ in diameter, with 1 or 2 layers of stroma, cells polyangular, about 4μ in size, upon which many conidiophores are produced. Conidiophores short, single celled, 6–8μ in length, conidia oblong, colorless, single celled, smooth, 6–7.5μ by 2.5–3.5μ.

On the material that Goto studied he found the acervuli to arise subcuticularly. He gave the following measurements: acervuli, 14–61μ in diameter, with some of those that have united once reaching over 109μ; conidiophores, about 10μ long and 3μ wide; conidia 4.2–9.3 by 2.4–3.3μ, or about the same as those of the Formosan type.

Referring to the fact that *Sphaceloma* fungi are difficult to isolate because of their slow growth, Goto reported that he was able to isolate *S. batatas* by placing a piece of diseased stem upon onion agar after it had been dipped in mercuric chloride (1:1000) for about one minute and washed. In the first set of cultures one out of eight tubes showed growth after seven days; in the second, two tubes out of eight. This growth was similar to cultures of *S. rosarum* from rose, *S. tsugii* from *Paulownia*, and *E. fawcettii* from *Citrus*. The cultures grew slowly and gradually became reddish brown and raised in the form of a crust.

Sphaceloma was not detected on specimens of stem and foliage scab from Campi-

[5] Data furnished by A. A. Bitancourt, Instituto Biologico, São Paulo, Brazil, who contributed the specimen from Alagoinhas.

nas, but on stem cankers an ascomycete of the genus *Elsinoë* (3) was present. Means are not available at this time to show whether the *Elsinoë* is the perfect stage of *S. batatas*. It is here suggested that it may well be; for in all species of *Sphaceloma* where the life history is known, *Elsinoë* has proved to be the ascogenous stage. It thus seems feasible to treat *S. batatas* as the conidial stage of the *Elsinoë* discovered on sweet potato stems in Brazil. This is described as follows:

Fig. 1.—Stem and foliage scab of sweet potato caused by *Sphaceloma batatas* Saw.: *A*, From Taihoku, Formosa, June 25, 1925, K. Sawada, part of the type specimen, received from Sawada in August, 1938, ×1; *B*, from Radio Hill, Guam, September, 1937, R. G. Oakley, ×1; *C*, from Amami Islands, Japan, September, 1937, T. Tamotu, received from Goto, September, 1939, ×1.

Elsinoë batatas Viégas and Jenkins, sp. nov.
Fig. 2, *A–C*

Maculàe in foliis plerumque circulares, parvae, cinnamomeo- brunneae; cancri in caulibus circulares, elliptici vel elongati, purpureo-brunnei interdum centro pallidiores; hyphae intraepidermicales vel subepidermicales demum fere superficiales, atro-cinereae, stromata 20–60×16–20μ formantes; asci in stratum singulum dispositi, globosi, 4–(6 ?) sporici, 15–16μ longi, 10–12μ lati; ascosporae hyalinae, 7–8μ longae, 3–4μ latae, septatae, curvatae.

On leaves, spots on interveinal regions, veins, and petiole, generally circular, small, on the dry specimen "mikado brown"[6]; on stems, circular, elliptical or elongate, "Hays brown," often with "wood brown" center; mycelium at first intraepidermal, later passing to the subepidermal tissue, i.e., to the cortical parenchyma, which becomes hypertrophied, the cells dividing actively in different planes, lower cells of this tissue divide longitudinally, collen-

[6] The color readings given in quotations are based on Ridgway's color standards (5).

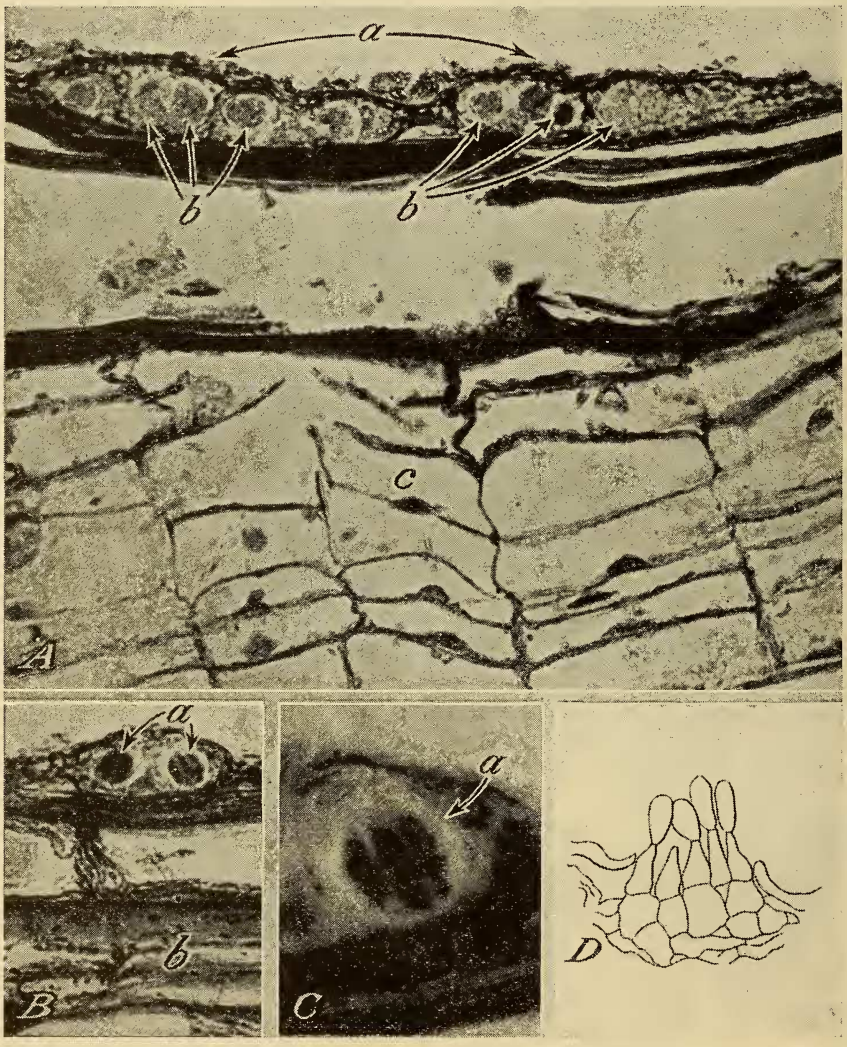

Fig. 2.—*Elsinoë batatas* on stem cankers of sweet potato from Campinas, São Paulo, Brazil: *A* and *B*, Sections showing fruiting layer of the *Elsinoë*, with asci (*A*, *b* and *B*, *a*) in a single series, ×500; *A*, *c*, and *B*, *b*, hypertrophied parenchyma in longitudinal sections; *C*, ascus from *B*, ×1,800; *D*, acervulus of *Sphaceloma batatas*, after Sawada.

chyma also hypertrophied, and soon the entire mass of tissue collapses, and the walls of the necrosed tissue darken; during this alteration of the tissue, hyphae of the fungus develop stromatically, at maturity they are external or practically so, dark gray, 20–60 by 16–20μ with a single row of asci; asci globose, with 4–(6 ?) spores, 15–16 by 10–12μ; ascospores hyaline 7–8 by 3–4μ, septate, curved. Conidial stage, *Sphaceloma batatas* Saw.

On leaves and stems of *Ipomoea batatas* Poir., Alagoinhas, State of Baía, and Campinas, State of São Paulo, Brazil.

Type specimen: Campinas, São Paulo, Brazil, January 14, 1939, A. S. Costa (Herb. Inst. Agron. de São Paulo 2726 and Myc. Coll. Bureau of Plant Industry 74289).

While it is likely that *Elsinoë batatas* might be introduced into new regions on slips of sweet potatoes, there is no indication as to whether it might be carried also on dormant tubers, which seems less plausible.

SUMMARY

Stem and folliage scab of sweet-potato vines was first reported from Formosa in 1931 by Sawada, for the period 1910–1928. In 1937 Goto identified the disease from the Amami Islands. Their accounts of the disease are the only ones previously published.

Specimens collected in Guam in 1937 by Oakley are diagnosed as affected by stem and foliage scab. In the field the disease could be recognized by the upright growth of the vines, as compared with their normal growth. Sweet potatoes in Guam "badly blighted by a fungus disease" in 1911 may have been affected by this malady.

Stem and foliage scab was discovered in Campinas, São Paulo, Brazil, by Costa in 1939, and by Boock in 1940, and also in Alagoinhas, Baía, Brazil in 1937, by Fawcett and Bitancourt.

Symptoms of the disease as described on leaves by Sawada and on stems by Goto are given, as well as Sawada's description of the pathogen which he named *Sphaceloma batatas*.

An ascomycete of the genus *Elsinoë*, discovered on cankers of stem and foliage scab from Campinas, is regarded as the perfect stage of *S. batatas* and is described as *E. batatas*.

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ORNITHOLOGY.—*A new honey-guide from Cameroon.*[1]

HERBERT FRIEDMANN, U. S. National Museum.

W. E. C. Todd, of the Carnegie Museum, Pittsburgh, has recently forwarded to me for study and identification three little honey-guides from Cameroon. Two of these are *Indicator exilis exilis*, but the third one does not fit any known species. It is apparently an adult bird and seems sufficiently different from the first two to warrant naming. Because it occurs in the same general area as *I. e. exilis*, it can not be described as a race of that species and must therefore be treated as a distinct species. It is proposed to call it—

[1] Published by permission of the Secretary of the Smithsonian Institution. Received May 6, 1943.